TRUTH or CONSEQUENCES

FISH and WILDLIFE

COORDINATION ACT REPORT

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Truth or Consequences
Sierra County, New Mexico
Fish and Wildlife Coordination Act Report

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Corps of Engineers
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Cover photo is a Gambel's quail. All photos by Brian Hanson

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Introduction

This is the Fish and Wildlife Coordination Act report for the Corps of Engineers (CE) project "Rio Grande Floodway, Truth or Consequences Unit, New Mexico" in Sierra County. It has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 stat. 401, as amended; 16 U.S.C. 661 et. seq.). Biological studies in the project area for the purposes of this report were conducted in cooperation with the CE and New Mexico Department of Game and Fish (NMDG&F). The NMDG&F concurred with the findings of this report by letter dated May 13, 1986 (Appendix 3).

Flood control measures for the Rio Grande below Elephant Butte were approved by Congress June 30, 1948 (Public Law 858, Flood Control Act of 1948). The purpose of the project is to reduce or eliminate flood damage in Truth or Consequences from waters originating in Cuchillo Negro Creek and emptying into the Rio Grande below Elephant Butte Dam. The eight alternatives the CE has considered are: floodplain management, floodplain evacuation, flood proofing, watershed treatment, levees, channel modification, detention dams and no action. The description of the alternatives for this report is based on the "Formulation Document, Rio Grande Floodway, Truth or Consequences Unit, N.M." (February 1985) with updated information provided to us April 24, 1986.

Fish and Wildlife Service (FWS) involvement in this project began in 1979 and information collected for it can be found in reports produced by FWS: August and September, 1980, March and April, 1981 and June and September 1982.

Should project plans change or a considerable amount of time elapse before this project is begun, the impacts on fish and wildlife should be re-examined.

Description of the Project Area

The project area includes the Cuchillo Negro watershed and the Rio Grande between Elephant Butte and Caballo Reservoirs in Sierra County, New Mexico (Figure 1). The 237,000 acre area is within the Chihuahuan Desert scrub community (Brown and Lowe 1980). Ponderosa pine, pinyon pine and juniper are found at higher elevations with grassland, creosotebush and mixed shrub communities at lower elevations. Wetlands and riparian areas are found along the Rio Grande. A detailed description of habitat types can be found in the May 1982 FWS report entitled "Biological Resources in the Truth or Consequences Study Area."

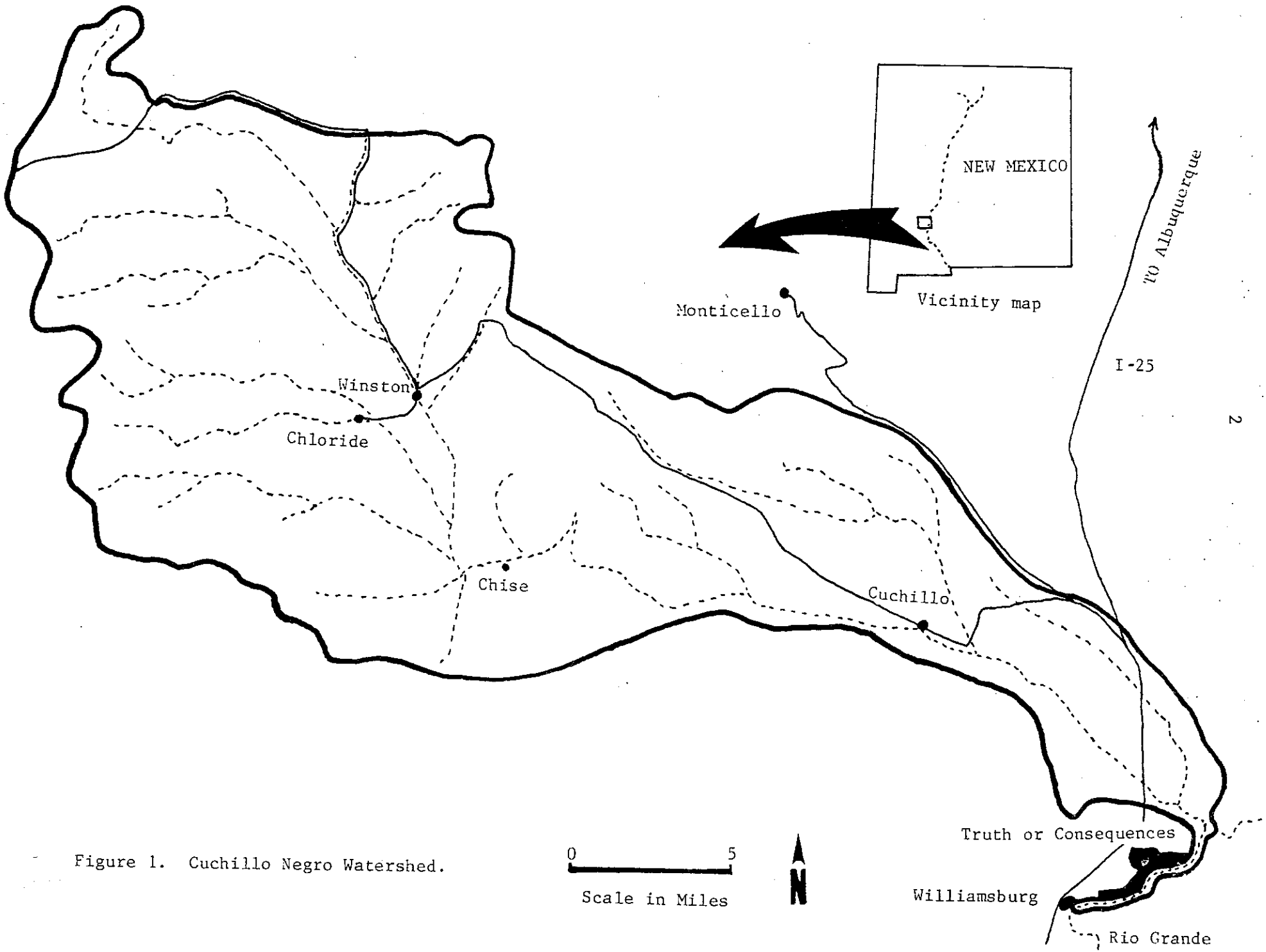

Figure 1. Cuchillo Negro Watershed.

Cuchillo Negro Creek is dry except for a three mile stretch 11 miles upstream of the Town of Cuchillo. Releases from Elephant Butte Reservoir provide perennial flows in the Rio Grande except during those times that the Bureau of Reclamation is performing channel maintenance.

Description of Project

The Corps of Engineers considered eight alternatives. Each alternative is briefly described below.

1. Floodplain management would restrict future use of the floodplain and develop a detailed emergency preparedness plan in the event of a flood.

2. Floodplain evacuation would result in the moving of all structures out of the floodplain.

3. Flood proofing would entail alterations to the present buildings, relocation of some building contents and plans to build new structures at a higher elevation within the floodplain.

4. Watershed treatment would slow and retain runoff water decreasing the size of a flood reaching Truth or Consequences. Watershed treatment would be effective for reducing runoff from storms that occur more frequently than the 10 year event but not effective for larger storms. This alternative could include grazing management, reseeding rangeland and construction of small check dams to prevent erosion.

5. Levees would include placement of dikes on the west side of the Rio Grande from Williamsburg upstream to Cuchillo Negro (5.5 miles) and dikes on the south side of Cuchillo Negro Arroyo near the Rio Grande (.7 miles). The dikes could be up to 30 feet tall, 162 feet wide for a distance of 5.5 miles. Land would be purchased next to the river and 120 structures would have to be moved to make room for the dikes.

6. Channel modification would increase the channel depth and width. A channel 900 feet wide (present width is 150 feet) would provide protection for the 50-year flood. Approximately 188 structures would have to be relocated.

7. Detention dams would be built on the Cuchillo Negro or Mescal Arroyos to hold large flows and release the stored water at a slow rate to prevent flood damage.

8. No action would allow the historic flows and flooding to occur.

Since the dam alternatives considered by the CE would be operated only for flood control, the impoundments would be fully evacuated after two days. The preferred project alternative by the CE is a detention dam on the Cuchillo Negro. The Cuchillo Negro watershed area was selected primarily because it poses the greatest flood threat to Truth or Consequences. Four dam alternatives were studied by the CE (Figure 2). The first three alternatives are single dam proposals with the fourth alternative a combination of Chise and Willow Springs Dams. Table 1 displays the size and location of the proposed dams.

Table 1. Proposed Detention Dams on the Cuchillo Negro.

Alternative	Dam Height(ft)	Dam Lenght(ft)	Maximum Floodpool Surface Area(acres)
Lower[a]	146	4,200	390
Cuchillo[b]	117	1,500	520
Chise[c]	160	700	390
Willow Springs[d]	107	1,960	145

a Located seven miles west of U.S. Highway 85.
b Located three miles downstream of Cuchillo.
c Located four miles downstream of Chise.
d Located on Willow Springs Creek near Cuchillo. This dry creek is a northern tributary of the Cuchillo Negro Creek.

The Cuchillo damsite was selected because it is the most economical to construct and would control runoff from 90 percent of the Cuchillo Negro watershed. It would retain a 100 year flood of 9,170 acre feet. The dam is designed to store 13,500 acre feet with 6,000 acre feet allocated for sediment storage. The spillway crest is at elevation 4,721 feet mean sea level (msl) with a maximum water surface elevation of 4,737 feet msl. At the maximum volume, 2.3 miles of Cuchillo Negro Creek would be flooded. Maximum discharge through the outlet works would be 2,300 cubic feet per second (cfs).

Fish and Wildlife Without the Project

Nine habitat types which support fish and wildlife have been identified in the project area (Appendix 1); riverine, wetland, riparian, mixed shrub, creosotebush, grassland, pinon-juniper/grassland, pinon-juniper and ponderosa. Our description of the habitats will be divided into aquatic and terrestrial types.

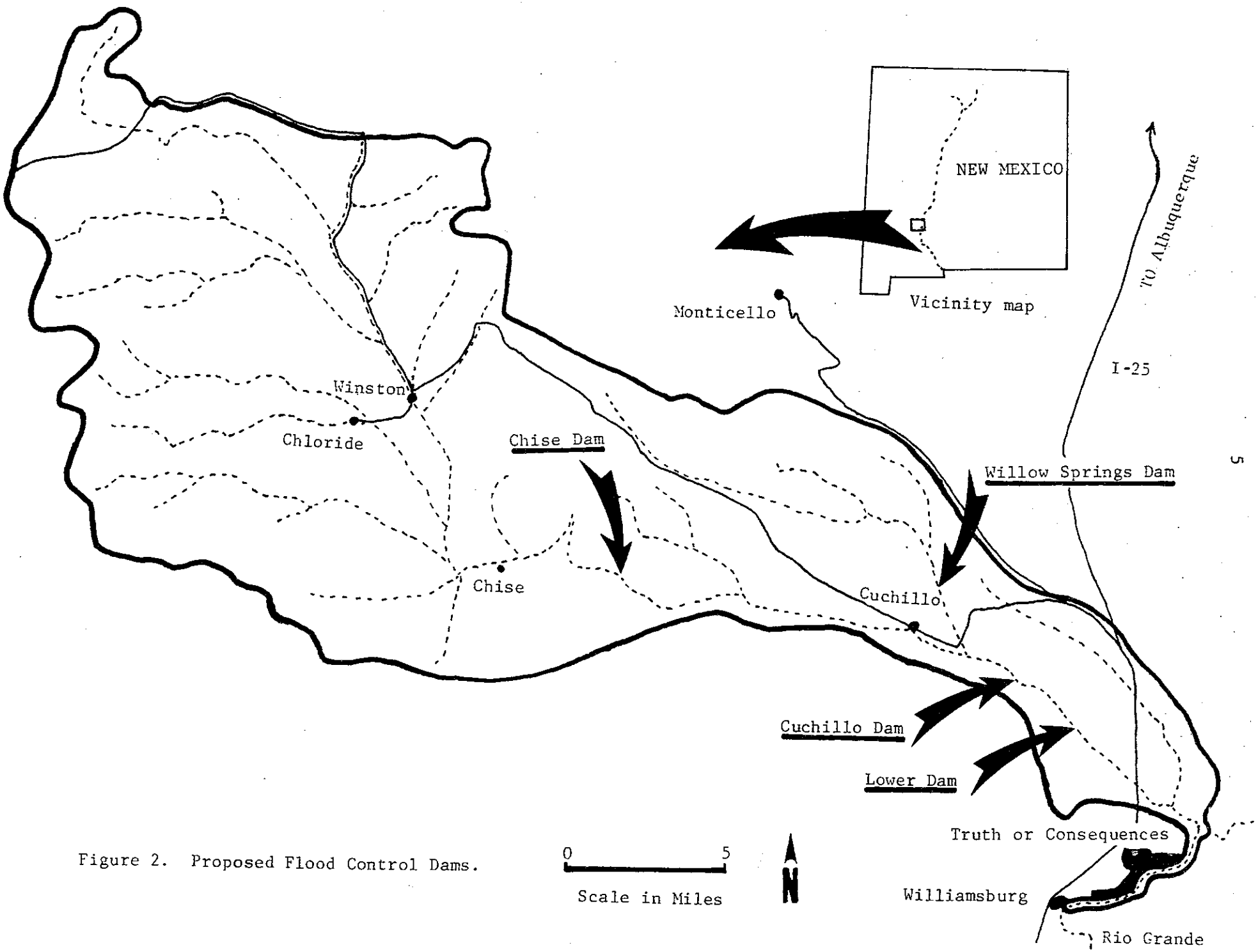

Figure 2. Proposed Flood Control Dams.

Aquatic Resources

Two habitat types, riverine and wetland, are included in this category. The riverine type includes a three mile stretch of the Cuchillo Negro and the Rio Grande between Elephant Butte and Caballo Reservoir. The perennial stretch of the Cuchillo Negro only supports one fish species, the longfin dace. The Rio Grande supports as many as 30 species of fish (Table 2). The most abundant fish are carp, catfish, gizzard shad and sunfish while rainbow trout and catfish are the most sought after game-fish. A post card survey of angler use conducted by NMDG&F in 1975 and 1978 indicated the area received 28,500 annual angler use days.

Table 2. Fish species which may occur in the Rio Grande between Elephant Butte Dam and Caballo Reservoir.[1]

Game Species	Nongame Species
Rainbow trout	Gizzard shad
Northern pike	Threadfin shad
Blue catfish	Goldifish
Black bullhead	Carp
Yellow bullhead	Red shiner
Channel catfish	Fathead minnow
Flathead catfish	Bullhead minnow
White bass	River carpsucker
Striped bass	White sucker
Green sunfish	Smallmouth buffalo
Bluegill	Mosquitofish
Longear sunfish	Warmouth
Smallmouth bass	
Largemouth bass	
White crappie	
Black crappie	
Yellow perch	
Walleye	

1. Burrough, M.A. 1980. Management Considerations for the Stream Fishing in the Rio Grande between Elephant Butte Dam and Caballo Reservoir. Master's thesis, New Mexico State University, Las Cruces. 85 pp.

The three wetlands in the project area (two are less than five acres each, while the Mims wetland is about 80 acres) are classified as persistent emergent wetlands in the palustrine system (Cowardin 1979) and are dominated by bulrushes and cattails (Figure 3). This habitat supports numerous water dependent animals such as raccoon and muskrat; several species of waterfowl, blackbird, marsh hawk, bullfrog and leopard frog.

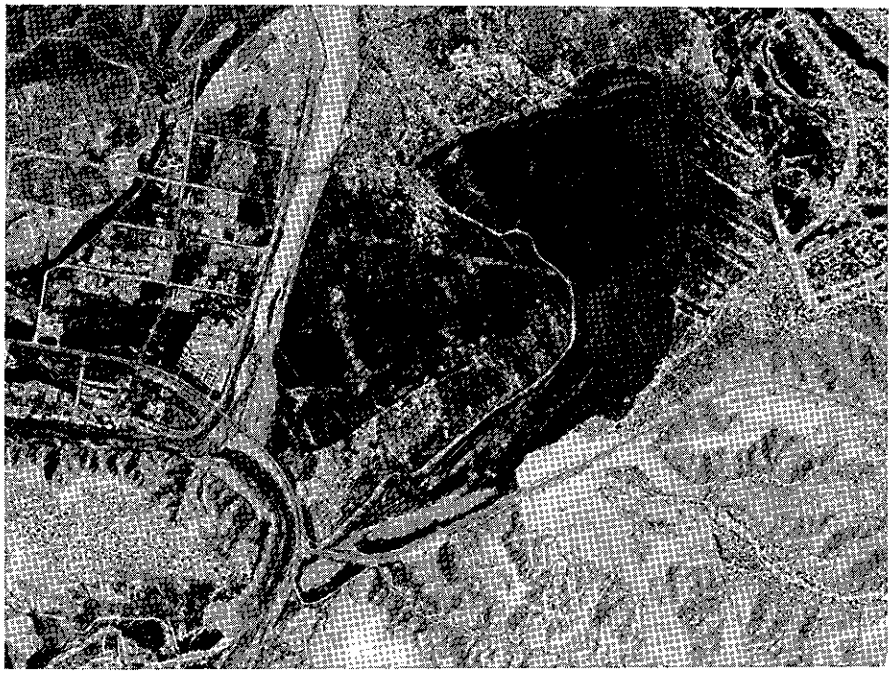

Figure 3. Aerial Photography of Mims Wetland

TERRESTRIAL RESOURCES

Seven terrestrial habitat types in the project area are: riparian, mixed shrub, creosotebush, grassland, pinon-juniper/grassland, pinon-juniper and ponderosa.

Riparian habitat is found mainly along the east bank of the Rio Grande, extending 150 feet from the shoreline in some places. This habitat is dominated by saltcedar, wolfberry and cottonwood (Figure 4). The riparian habitat along the Rio Grande is very valuable for wildlife, especially birds. As many as 243 bird species have been found in and adjacent to riparian strips near Elephant Butte Reservoir (Raitt R. J. and M. C. Delasantro 1980). Among the sixty species of birds that were identified during four FWS surveys along the Rio Grande, the most common birds were the swallow, house sparrow, phainopepla and mourning dove. A State listed endangered species, the Bell's vireo, was sighted by FWS personnel. Farm residences in the Cuchillo Negro watershed are also surrounded by riparian-like vegetation including cottonwood, saltcedar and Russian olive trees (Figure 5). Because deciduous trees are uncommon in the Cuchillo Negro drainage, they are valuable habitat for wildlife.

Figure 4. Riparian Vegetation along the Rio Grande

Figure 5. Trees Often Surround Farm Residences in the Cuchillo Area

Mixed shrub is dominated by mesquite, burrobush, saltbrush, with several grass species in association. Wildlife species which are common and/or prefer the mixed shrub habitat are desert cottontail, jackrabbit, Gambel's quail, verdin, cactus wren, greater earless lizard and side-blotched lizard.

The creosotebush habitat type has a high percentage of bare ground and sparcely spaced shrubs. Plant species include creosotebush, mesquite, broom snakeweed, grama grass and tobosa grass. The Merriam's kangaroo rat, black-throated sparrow, desert grassland whiptail lizard and leopard lizard are found in this habitat type.

Grama grasses are the dominant species in the grassland habitat. Other grass species include bush muhly, three-awn, dropseed and tobosa grass. Ord's kangaroo rat, plains harvest mouse, hispid pocket mouse, kit fox, badger, pronghorn antelope, red-tailed hawk, scaled quail, horned lark, western meadowlark and desert grassland whiptail lizard are all found in the rolling terrain of the grassland habitat.

Pinon-juniper/grassland is dominated by pinon pine, one-seed juniper and grama grass. Species of animals found in this habitat type are a combination of the grassland and the pinon-juniper habitat types.

In pinon-juniper habitat the one-seed juniper and pinon pine dominate a variety of understory shrubs and grasses. Other plants include alligator juniper, oak, mountain mahogany, apache plume, opuntia cactus, wolfberry, Wright's silk-tassel, buckwheat and several species of grasses. This habitat type is found on steep rocky hillsides. Resident species of animals include the pinon mouse, porcupine, mule deer, mountain chickadee, plain titmouse and Townsend's solitaire.

The ponderosa pine habitat is found in small pockets on north facing slopes. Plant species in this type include silver leaf oak, Gambel's oak, gray oak, mountain mahogany, muttongrass, side oats grama, blue grama and mountain muhly grass. Animal species in this habitat include mule deer, Abert's squirrel, turkey, eastern cottontail, and cliff chipmunk.

Animals that are hunted or trapped in the project area include the cottontail, Abert's squirrel, coyote, swift fox, kit fox, gray fox, mountain lion, bobcat, mule deer and pronghorn. Game birds in the area include various waterfowl species, scaled quail, Gambel's quail, white-winged and mourning dove.

Endangered Species

Under the authority of the Endangered Species Act of 1973, as amended, the FWS has developed a listing of threatened or endangered species.

Endangered species that may be found in or near the project area include the bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), and whooping crane (Grus americana). These species are infrequent visitors to the project area and the habitat is marginal relative to their requirements, therefore we do not believe this project will impact them.

The State of New Mexico has a list of protected species. The term endangered has been divided into two categories: State Endangered - Group 1 (species whose prospect of survival or recruitment in the State are in jeopardy) and State Endangered - Group 2 (species whose prospect of survival or recruitment in the State may become in jeopardy in the foreseeable future). The peregrine falcon is listed by the State of New Mexico as a Group 1 species. Eight species that occur in the project area are listed as Group 2 species: olivaceous cormorant (Phalacrocorax olivaceus), Mississippi kite (Ictinia mississippiensis), bald eagle, whooping crane, Bell's Vireo (Vireo bellii), McCowan's longspur (Calcarius mccownii), trans-Pecos rat snake (Elaphe subocularis) and the Sonora mountain kingsnake (Lampropeltis pyromelana pyromelana).

The olivaceous cormorant, Mississippi kite and Bell's vireo are species of historic record in the riparian and wetland habitats along the Rio Grande. Mims wetland provides excellent habitat for the olivaceous cormorant in the form of roost and nest trees. Cottonwood trees along the river could provide habitat for the Mississippi kite. The FWS sighted a Bell's vireo in a cottonwood downstream of Ralph Edwards Park in Truth or Consequences in March of 1985. The McCowan's longspur (found in the shortgrass prairie), trans-Pecos rat snake (found in shrubby, rocky areas) and the Sonora mountain kingsnake (found in pinon/juniper and pine-fir forests) may be found in the Cuchillo Negro watershed.

Future Fish and Wildlife Without the Project

We do not expect significant changes in fish and wildlife habitat in the future. Residential development has occurred on the west side of the Rio Grande and we expect no land use changes on the east side where agriculture related activities are occurring. The land use in the Cuchillo Negro watershed above the Rio Grande is not expected to change.

Fish and Wildlife Impacts With The Project

Biological impacts of each project alternative are briefly discussed as follows:

The floodplain management alternative would be beneficial to fish and wildlife. In the future there should be fewer structures and people in the floodplain. This alternative would allow vegetation management along the river which would result in higher wildlife populations. With fewer people in the floodplain there would also be less human disturbance of wildlife.

The floodplain evacuation alternative would provide immediate benefits to wildlife. Fewer structures and people in the floodplain would result in higher wildlife utilization of the area.

The flood proofing alternative would have no appreciable effect on fish and wildlife. Buildings and human activity would remain in the area as before.

The watershed treatment alternative would also have beneficial effects on fish and wildlife. Watershed treatment would reduce erosion, increase vegetation production and reduce peak runoff flows. The resulting increase in water quality would benefit the fishery. Reduced siltation in the Rio Grande would also lengthen the useful life of Caballo Reservoir thereby increasing the number of years the reservoir will support a fishery. Additional vegetation would provide more food and cover for wildlife. Reduced peak runoff would allow wildlife populations to become better established. It should be noted that watershed treatment would only be effective in reducing small flood events.

The levee alternative would result in a direct loss of 5.5 miles of riparian vegetation and wetlands on the west bank of the Rio Grande. This impact would reduce the number of birds found along the Rio Grande and might also reduce species diversity. Fish habitat found under the existing bank vegetation would be eliminated. Water quality in the river would be adversely affected by levee construction activities and erosion from the levee. A levee on the south side of Cuchillo Negro Arroyo would partially divert large flood flows into Mims wetland filling it and the surrounding woody vegetation with silt.

The channel modification alternative is the most destructive to fish and wildlife as it would destroy all of the riparian habitat and some wetland habitat on both sides of the river for 5.5 miles. Those species dependent on the riverine, riparian and wetland habitats would be eliminated. Deep holes in the river utilized by fish would be removed and fish cover in the form of bank vegetation, shoreline indentations and shade would be destroyed. Insects, worms and other organsisms produced in the vegetation and used for food by fish and birds would be eliminated. Benthos (bottom dwelling plants and animals) would be eliminated in the Rio Grande.

The detention dam alternative could have both adverse and beneficial fish and wildlife impacts. Temporary storage of water behind a dam could flood and kill the vegetation from inundation and by the silt deposited on vegetation (Figure 6). Some vegetation such as saltcedar, might become established as a result of dam operation but it probably would be removed during maintenance of the area. Impacts to vegetation would also occur during the excavation of borrow material for the dam and construction of access roads. Farm residences in close vicinity which would have to be abandoned because of the dam construction, with a loss of trees and other vegetation valuable to wildlife as a result of farms being abandoned because of the dam. The only dam site with riparian vegetation is the Cuchillo Dam site. Within the 100 year flood pool approximately 300 trees are present (Appendix 2). The majority of the trees are hackberry, peach, cottonwood, saltcedar and Russian olive (Table 3). As a result of dam construction and operation, the trees would either be removed or die due to lack of water. Wildlife associated with this vegetation would be killed or displaced by the construction activity. Windmills, ponds and streams in the area would be abandoned or destroyed as a result of the detention dams, thereby losing some valuable permanent water sources for locally occurring wildlife.

Table 3. Trees identified in the flood pool area (up to elevation 4,737 feet) of the Cuchillo Dam site, June 25, 26, 1985.

Tree	Number
netleaf hackberry	86
peach	38
Rio Grande cottonwood	34
saltcedar	32
Russian olive	31
plum	20
elm	14
pecan	8
Texas mulberry	9
walnut	6
pine	4
soapberry	4
desert willow	3
velvet ash	2
silk tree	1
Total	294

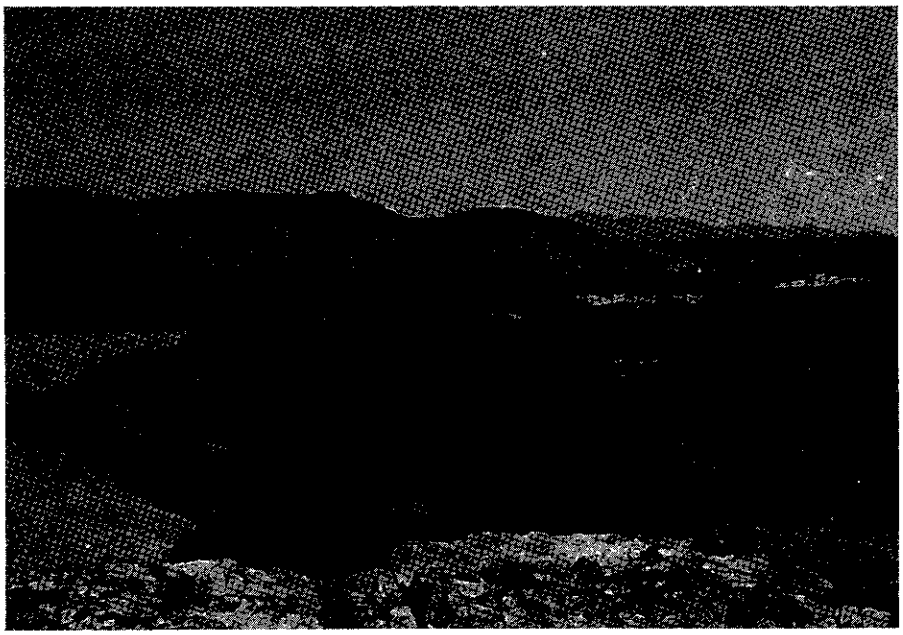

Figure 6. Cuchillo Negro Valley which would be flooded with the Cuchillo Dam Alternative

The detention dams would trap much of the silt from flood runoff, decreasing turbidity of flood waters entering the Rio Grande and reducing silt deposition in Caballo Reservoir. The Mims wetland area would receive less silt as a result of lower flows from a detention dam, thus extending the life of the area. The detention dams may also prevent recreational access (currently a four-wheel drive vehicle can be driven down the Cuchillo Negro river bed).

Impacts caused by the Cuchillo Dam would include loss of: a) water sources for wildlife, such as ponds and irrigation ditches, b) large woody vegetation such as cottonwood, hackberry and walnut (approximately 300 trees total), c) mixed shrub habitat which is primarily burrobrush, saltbush, mesquite and creosotebush, and d) recreational access.

The Chise Dam site would cause flooding of the only perennial stream section of the Cuchillo Negro Arroyo. The longfin dace and other wildlife dependent on this stream would be eliminated. In contrast the Lower, Cuchillo and Willow Springs Dam proposals would not impact a flowing stream.

Chise Dam site would have the greatest impact on fish and wildlife followed by the Cuchillo, Willow Springs and Lower Dams. Mitigation would be required for the Chise and Cuchillo Dam alternatives, however, it would not be necessary for the Willow Springs and Lower dams.

It is unlikely that Federally endangered species would be adversely impacted by any of the alternatives. However, the levee and channel modification alternatives would adversely impact habitat for the State listed olivaceous cormorant, Mississippi kite, and Bell's vireo. Floodplain management, floodplain evacuation and watershed treatment would benefit the olivaceous cormorant, Mississippi kite Bell's vireo, McCowan's longspur, trans-Pecos rat snake and the Sonora mountain kingsnake. The detention dam alternative would help preserve the habitat for the olivaceous cormorant at Mims wetland while levees and channel modification would adversely affect habitat for the olivaceous cormorant, Mississippi kite and Bell's vireo.

Discussion

Construction projects which result in adverse impacts to fish and wildlife require the development of mitigation plans. These plans take into consideration the value of fish and wildlife habitat affected. The FWS has established a mitigation policy used as guidance in recommending mitigation to development agencies and the public (FWS 1981). This policy states that the degree of mitigation should correspond to the value and scarcity of the habitat at risk. Four resource categories in decreasing order of importance are identified below:

Resource Category No. 1 habitats of high value for the species being evaluated that are unique and irreplaceable on a national basis or in the ecoregion section. No loss of existing habitat value should occur.

Resource Category No. 2 habitats of high value that are relatively scarce or becoming scarce on a national basis or in the ecoregion section. No net loss of in-kind habitat value should occur.

Resource Category No. 3 habitats of high to medium value that are relatively abundant on a national basis. No net loss of habitat value should occur and loss of in-kind habitat should be minimized.

Resource Category No. 4 habitats of medium to low value. Loss of habitat value should be minimized.

We have categorized the habitats in the project area as follows:

category 1 - none; category 2 - riparian, wetland; category 3 - riverine, pinon-juniper, pinon-juniper/grassland, ponderosa; and category 4 - creosotebush, grassland, mixed shrub.

The alternatives for watershed treatment, floodplain evacuation and floodplain treatment would be beneficial to fish and wildlife. The flood proofing alternative would have no affect on wildlife. The levee and channel modification alternatives would have significant adverse affects on valuable fish and wildlife habitat from resource categories 2 and 3. The levee alternative would eventually destroy an 80 acre wetland and over 50 acres of riparian habitat near the wetland and along 5.5 miles of the Rio Grande. Channel modification, while not affecting the Mims wetland, would have an adverse impact on the riparian habitat along the Rio Grande. Habitat losses caused by the levee or channelization alternatives cannot be mitigated.

Since the Chise Dam alternative would impact or eliminate a three-mile reach of free-flowing stream, a resource category 3 habitat, another three-mile stream should be created for mitigation. This might be accomplished by piping the present spring water to the dry streambed below the proposed Chise Dam. If this stream area is not suitable, other locations downstream along the Cuchillo Negro should be considered. If it is determined another stream reach cannot be created, Chise Dam should not be constructed.

Detention dams on the Cuchillo Negro will drastically reduce the amount of silt entering the Mims wetland during floods, thereby extending the life of the wetland. The CE has estimated that these flood control measures will extend the life of the wetland to approximately 200 years compared to 100 years without a flood control dam. This beneficial effect to valuable wildlife habitat would offset losses caused by flooding and siltation of mixed shrub vegetation within the inundation areas of all the proposed detention dams.

Since riparian habitat is particularly valuable for wildlife (resource category 2), any unavoidable loss of trees should be mitigated by replacement in-kind. The area within the Lower Dam alternative does not support large trees and does not require mitigation. Approximately 300 trees of various sizes, ages and condition would be eliminated in the 100-year flood pool area within the Cuchillo Dam alternative. We recommend planting four acres of cottonwood and Russian olive to mitigate tree losses. The ultimate goal is to establish a total of 40 cottonwoods and 40 Russian olives in a four acre area. The FWS should be involved in the selection of a suitable mitigation site and methods of tree planting. The estimated cost for cottonwood establishment range from $2,500 to $5,000 per acre, for a maximum total mitigation cost of $20,000.

The proposed dams may prevent recreational access along the Cuchillo Negro riverbed. The CE should insure that the present access is maintained with construction of any dam.

We suggest the CE include watershed treatment as part of each flood control alternative. This would slightly reduce the magnitude of any structural alternative and would have multiple benefits rather than the single benefit of flood control.

A dam on the Cuchillo Negro could benefit fish and wildlife if water was stored. Wetland and riparian vegetation would become established and a fishery could be established if a permanent pool could be maintained. Therefore, we recommend that construction of a dam at Lower Cuchillo or Willow Springs include permanent water storage.

We suggest the CE enhance fish and wildlife wildlife habitat by including the purchase and protection of the Mims wetland in the project. This 130 acre area contains 80 acres of wetlands and 50 acres of saltcedar and mesquite. The wetlands are used extensively by waterfowl and amphibians and the saltcedar-mesquite area is heavily used by quail, mourning dove and rabbits (Figure 7). This valuable area should be protected from development, water withdrawals for the golf course, and siltation. Purchase of the area would stop its destruction by development. The wetland would last much longer if silt could be prevented from entering the wetland from Cuchillo Negro Arroyo and the drainage area to the east. The wetland would also benefit from a dependable water supply.

Figure 7. Mims wetland supports waterfowl such as these cormorants

We suggest the CE enhance fish and wildlife with this project by plantings of cottonwoods in addition to the required mitigation plantings. Cottonwood dominated vegetation supports the highest bird densities and numbers of species of any habitat (Hink and Ohmart 1984, Anderson and Ohmart 1984, Hildebrandt and Ohmart 1982, Raitt and Delasantro 1980, Johnson 1970). Tree plantings in mitigation areas could be expanded or new areas could be established. Large clumps of cottonwoods of greater than 20 acres in size would be especially valuable if located adjacent to the Rio Grande. Cottonwood pole planting, a cheaper method, could be used where groundwater is at depths of one to 10 feet. An excellent location would be in the Mims wetland area or at the junction of the Cuchillo Negro and Rio Grande.

Recommendations

Based on our evaluation of fish and wildlife impacts of the proposed alternatives provided by the CE in their February 1985 document, the FWS recommends:

1. Mitigation and enhancement of fish and wildlife be included in the authorizing legislation as project purposes.

2. Floodplain Management, Floodplain Evacuation or Watershed Treatment be adopted.

3. The alternatives of levees, channel modification and the Chise Dam on Cuchillo Negro Creek be dropped from further consideration.

4. If any of the proposed dams in Cuchillo Negro Creek are constructed, the CE insure the present level of recreational access is maintained.

5. If the proposed Cuchillo Dam in Cuchillo Negro Creek is constructed, four acres of trees should be established for mitigation with the FWS involved in detailed planning.

6. For enhancement of fish and wildlife, water should be stored behind the Lower Cuchillo or Willow Springs Dam.

7. The Mims wetland area should be purchased and managed for enhancement of fish and wildlife.

8. For enhancement of fish and wildlife, cottonwoods should be planted in the Mims wetland area, adjacent to the Rio Grande or near the final proposed dam site.

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U.S. Fish and Wildlife Service. 1981. U.S. Fish and Wildlife Mitigation Policy. Federal Register 46(15):7644-7663.

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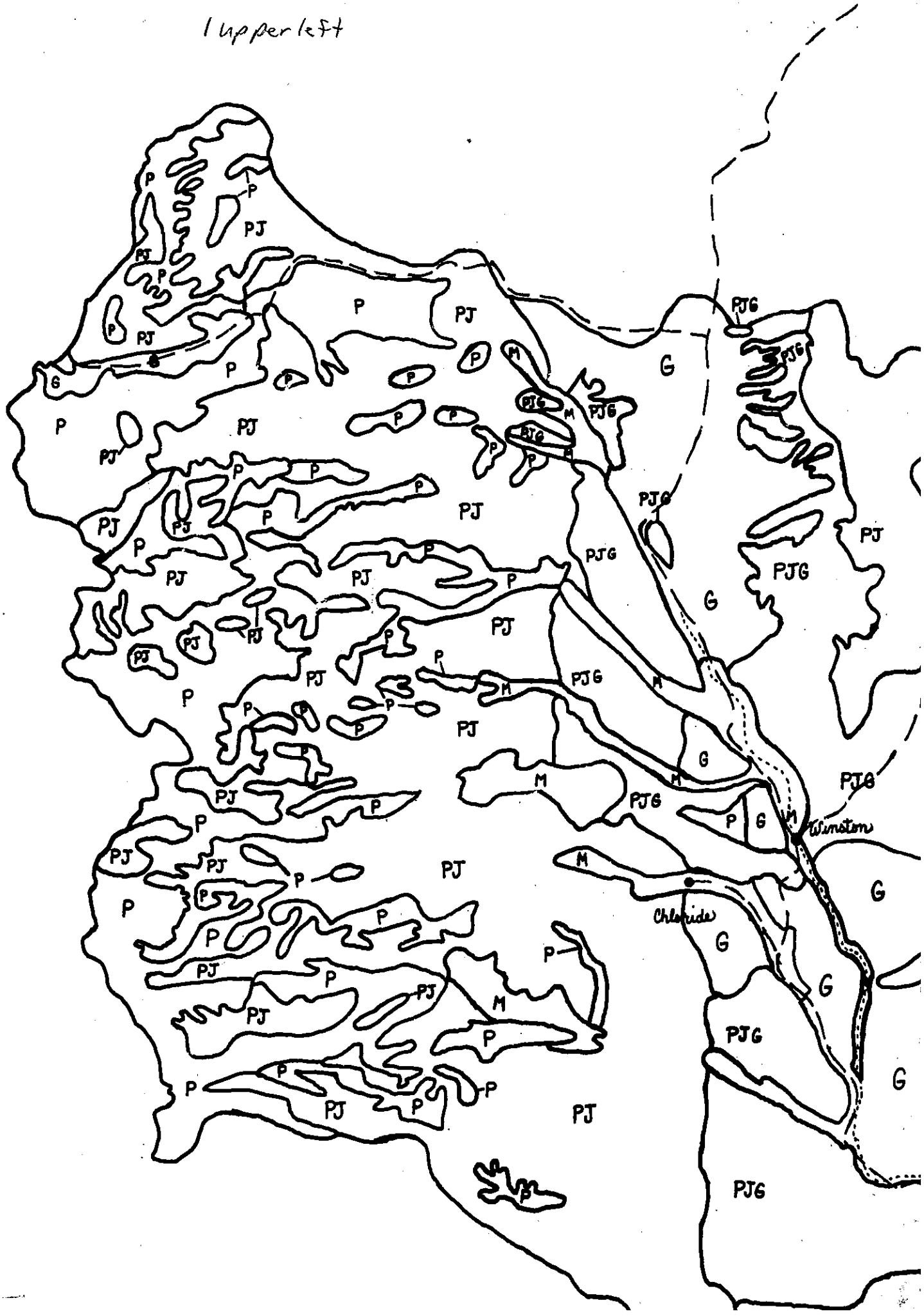
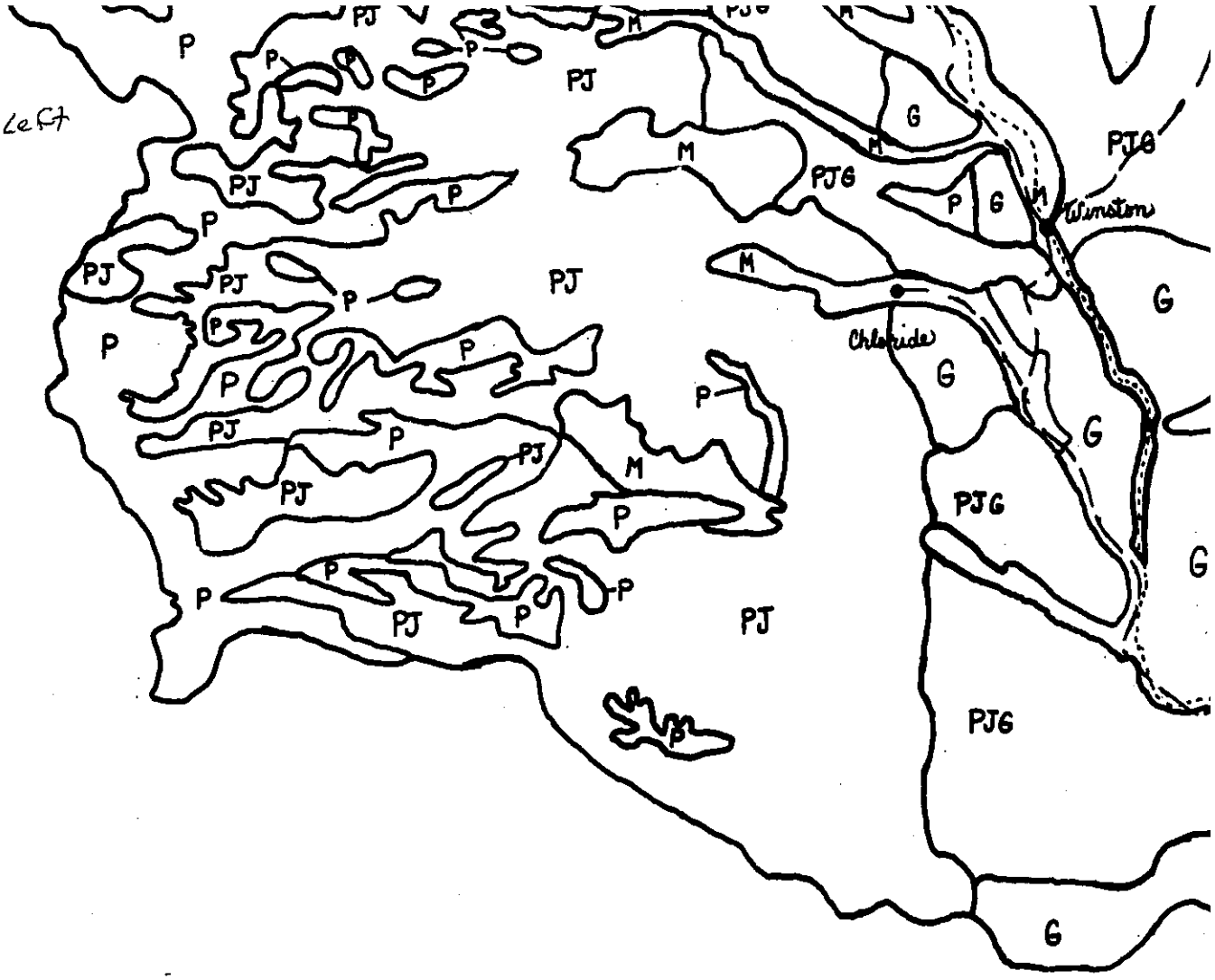


2 Lower Left



Legend

N

Scale 0 1 2

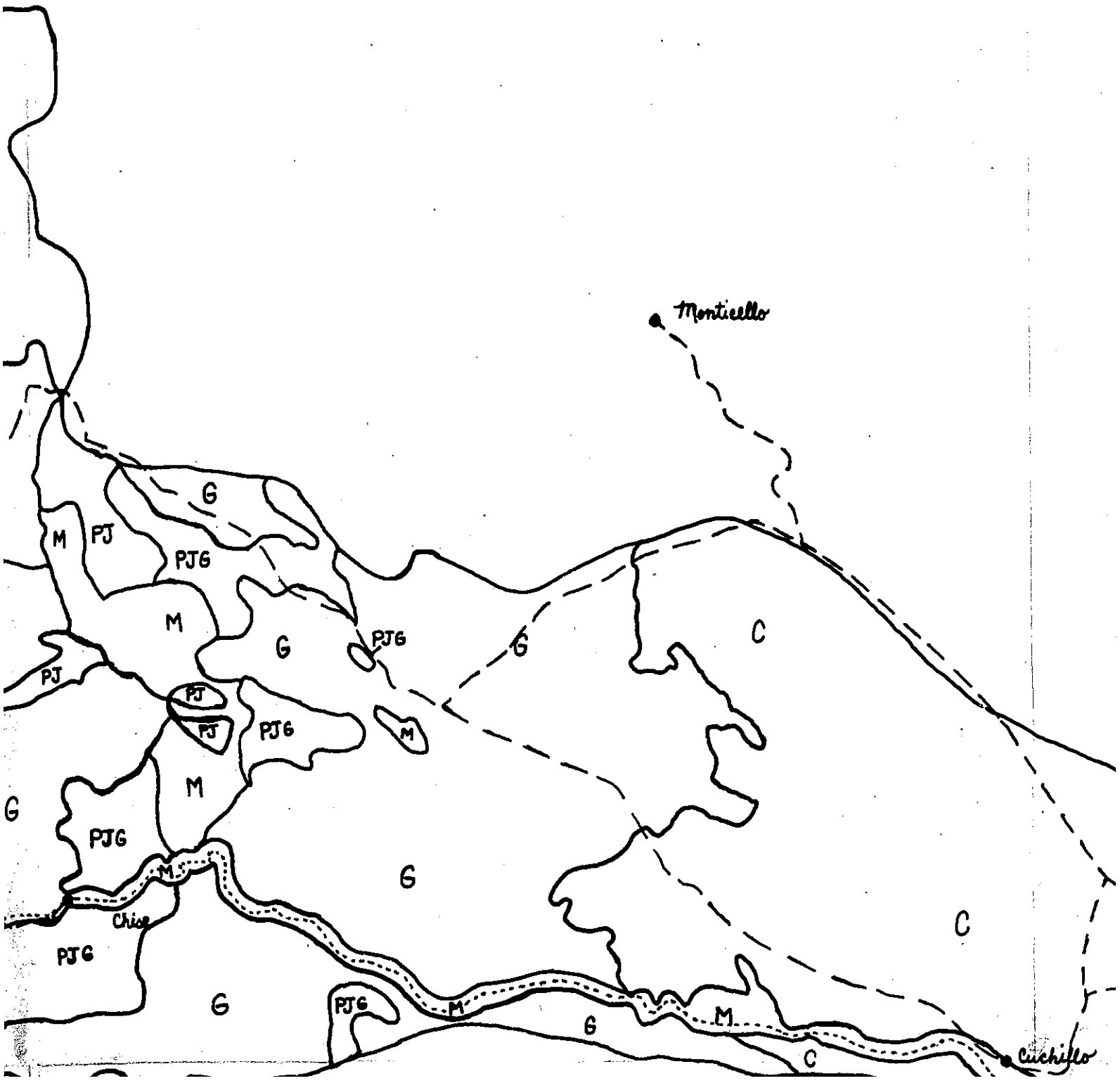
Road

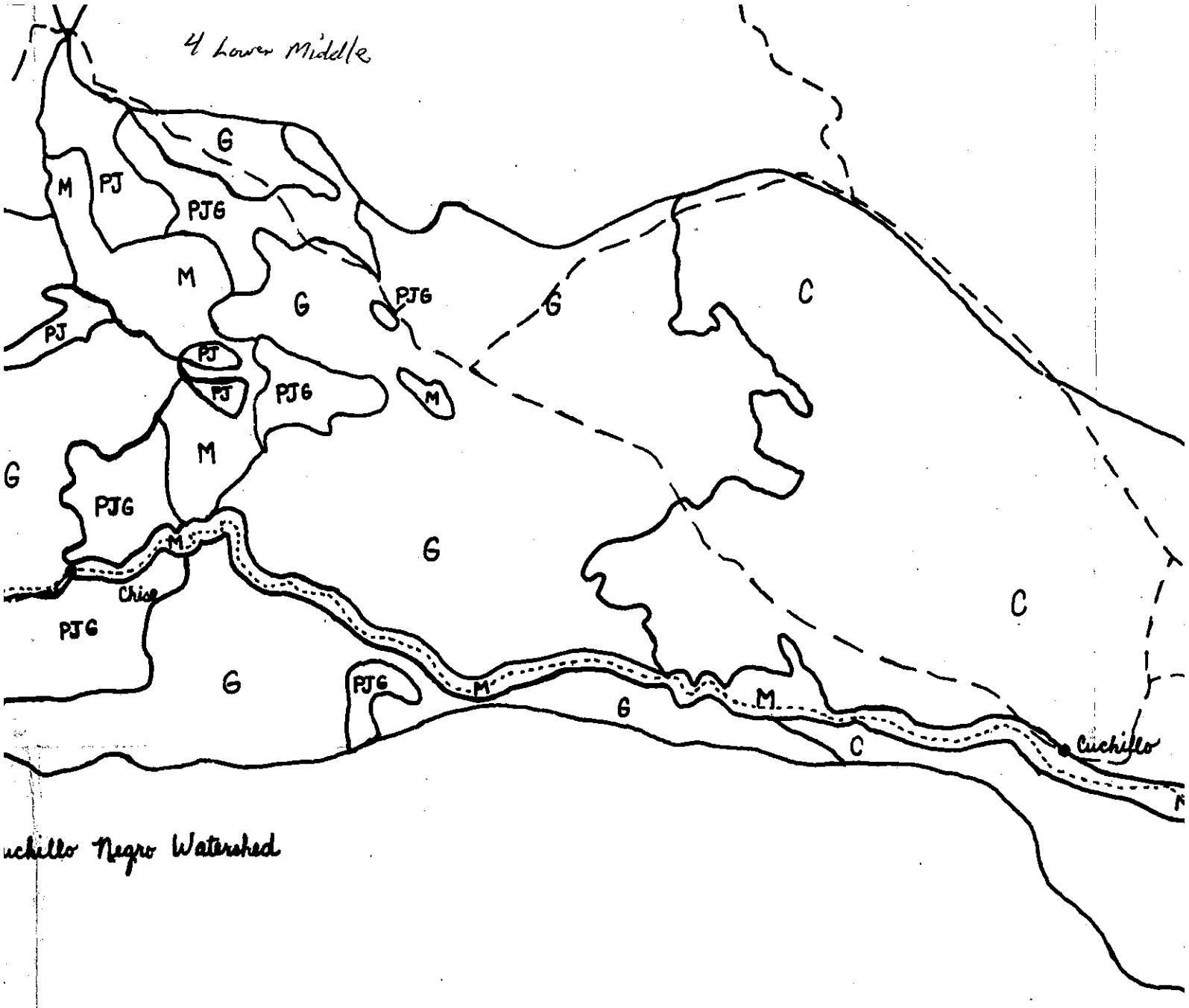
Stream

Vegetation Type

Ponderosa pine
Piñon-juniper
Piñon-juniper/gr
Grassland
Mixed shrub
Creosotebush

3 Upper Middle





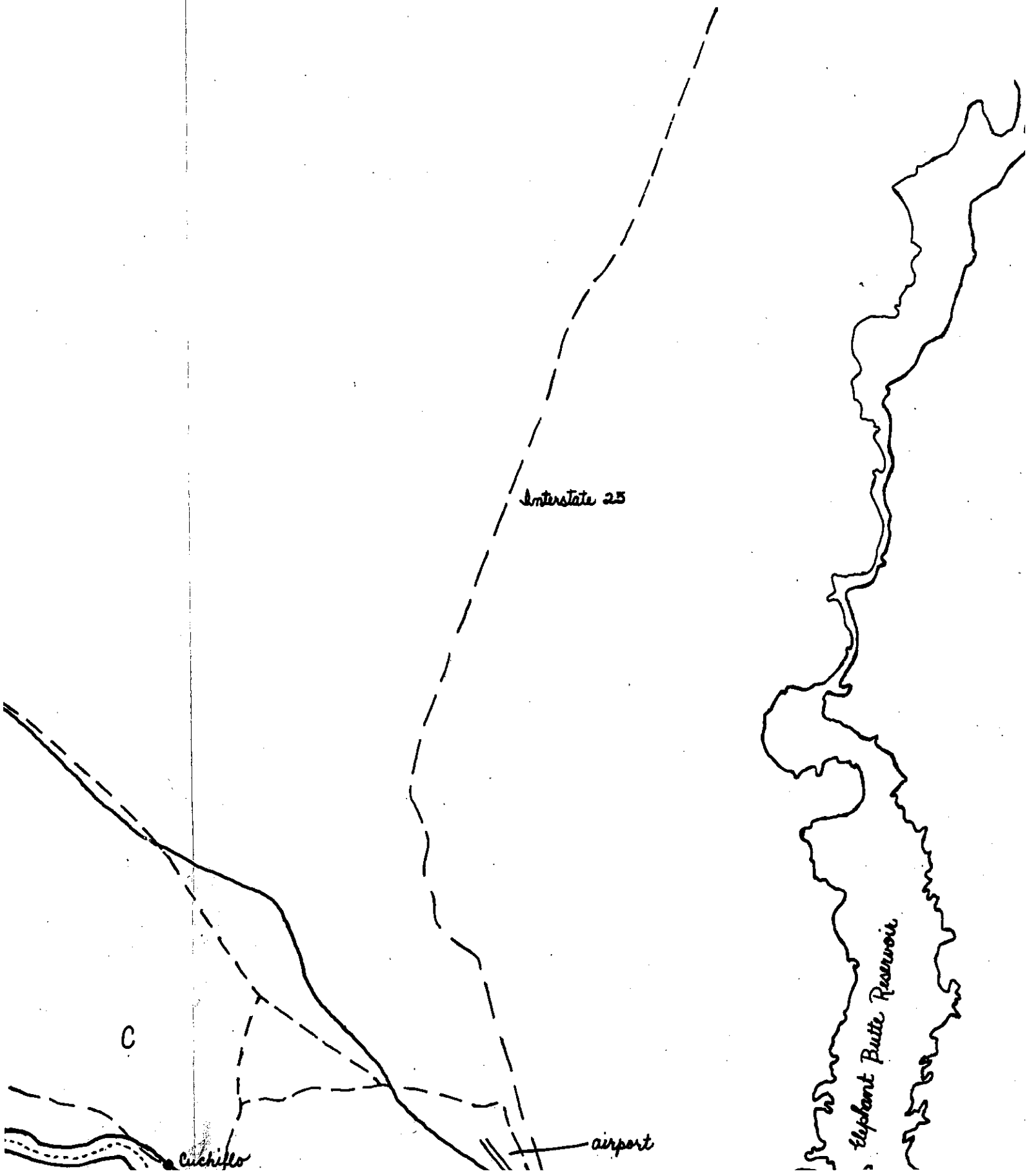
uchillo Negro Watershed

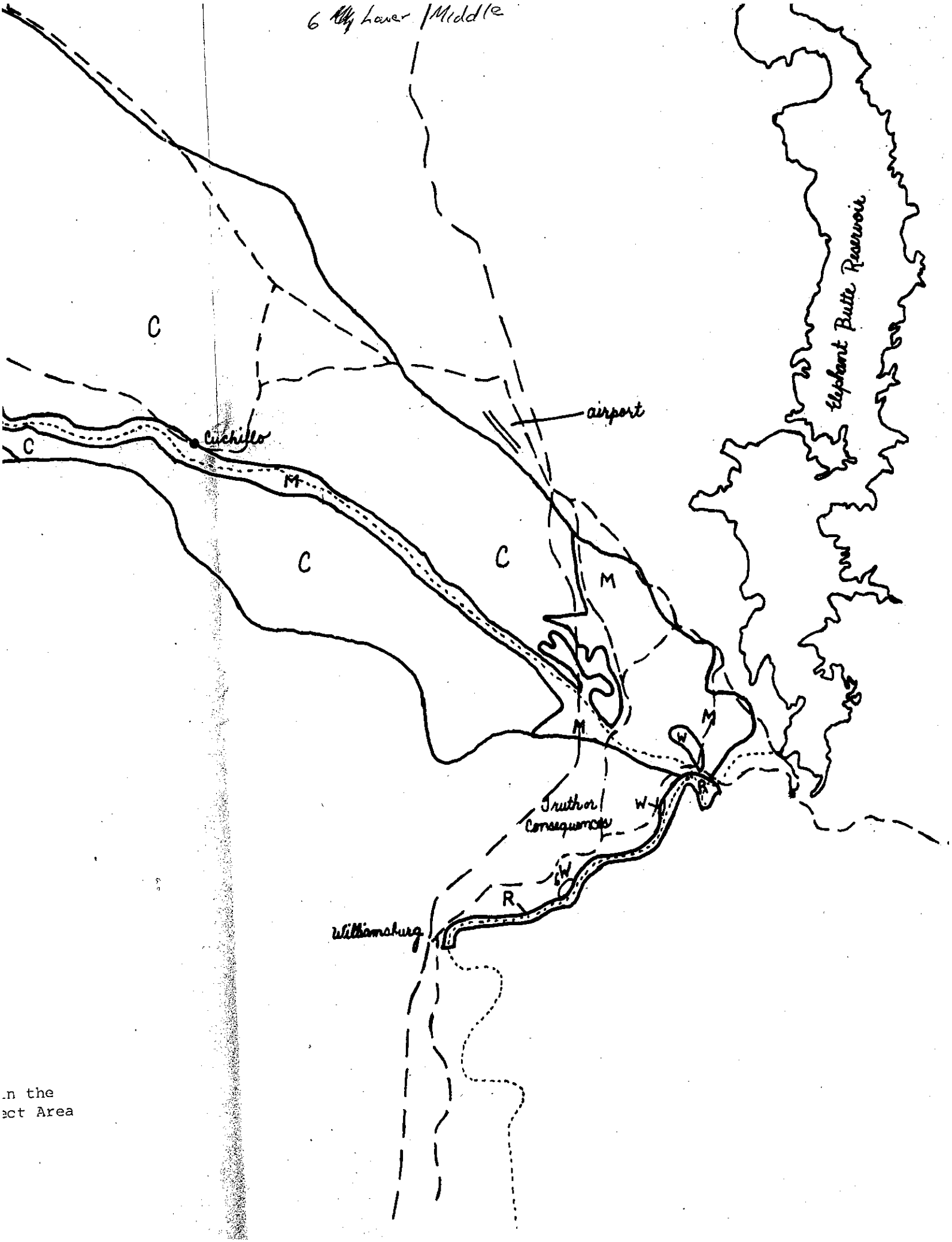
3 miles

P
PJ
PJG
G
M
C

rassland

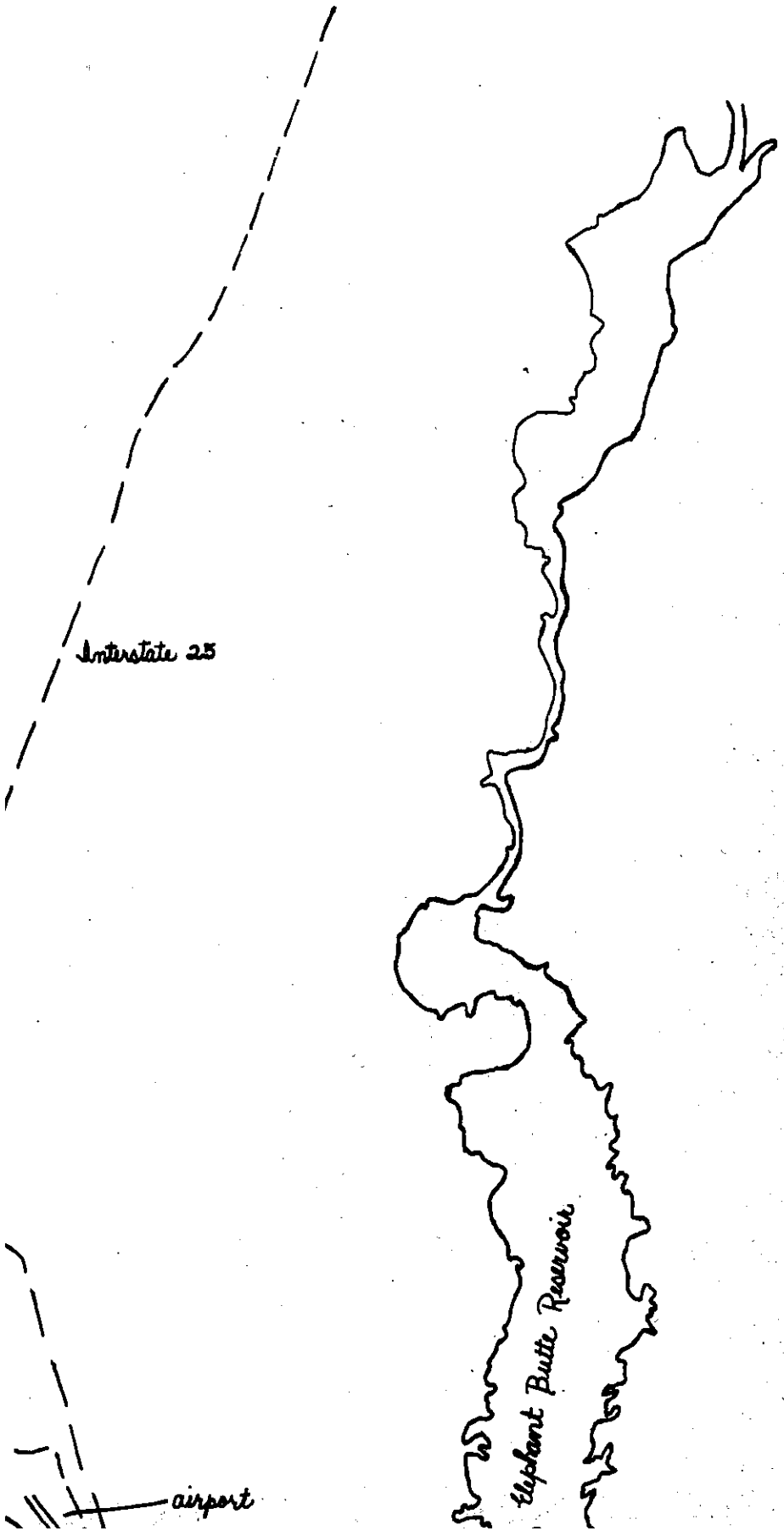
5 Upper Middle

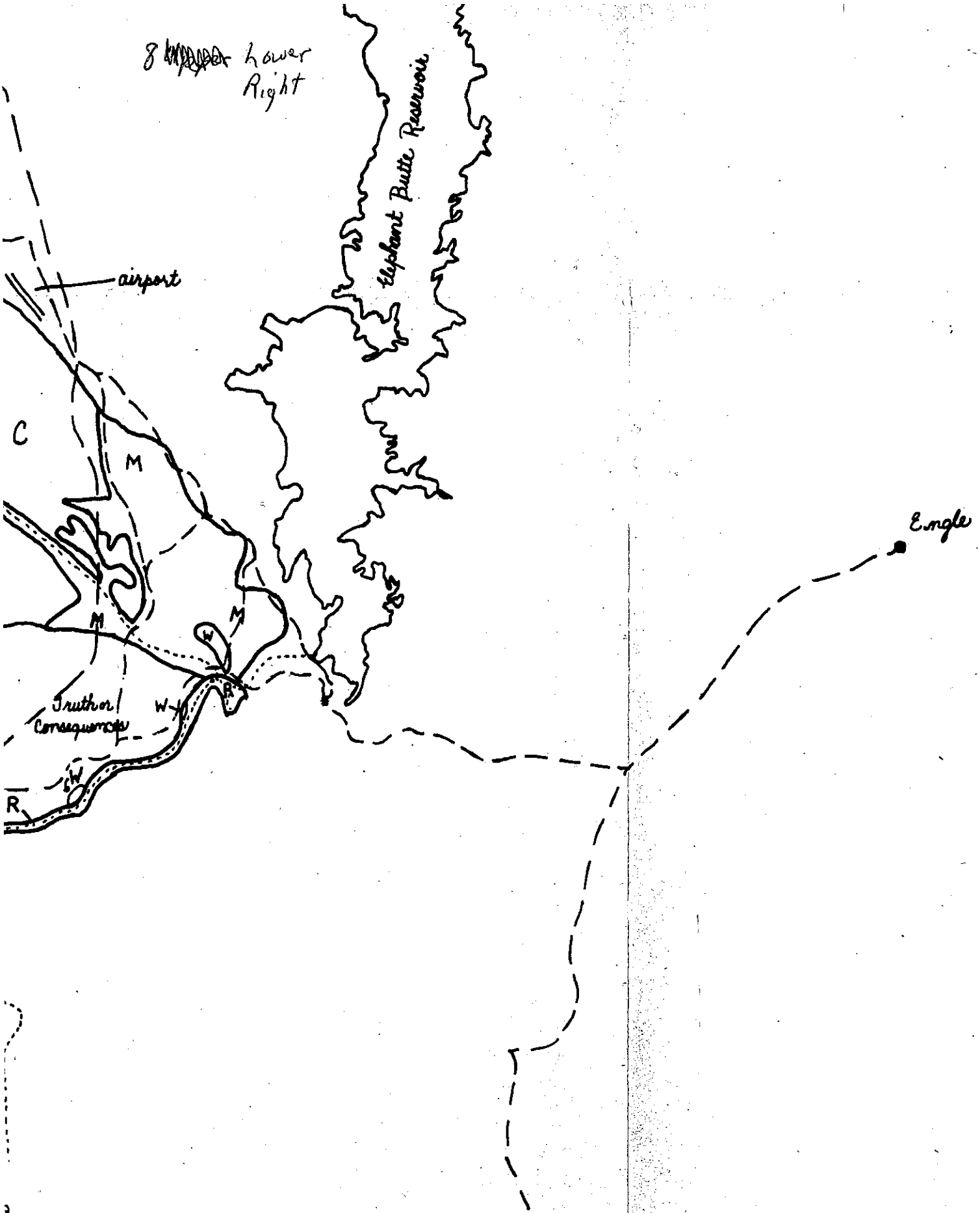




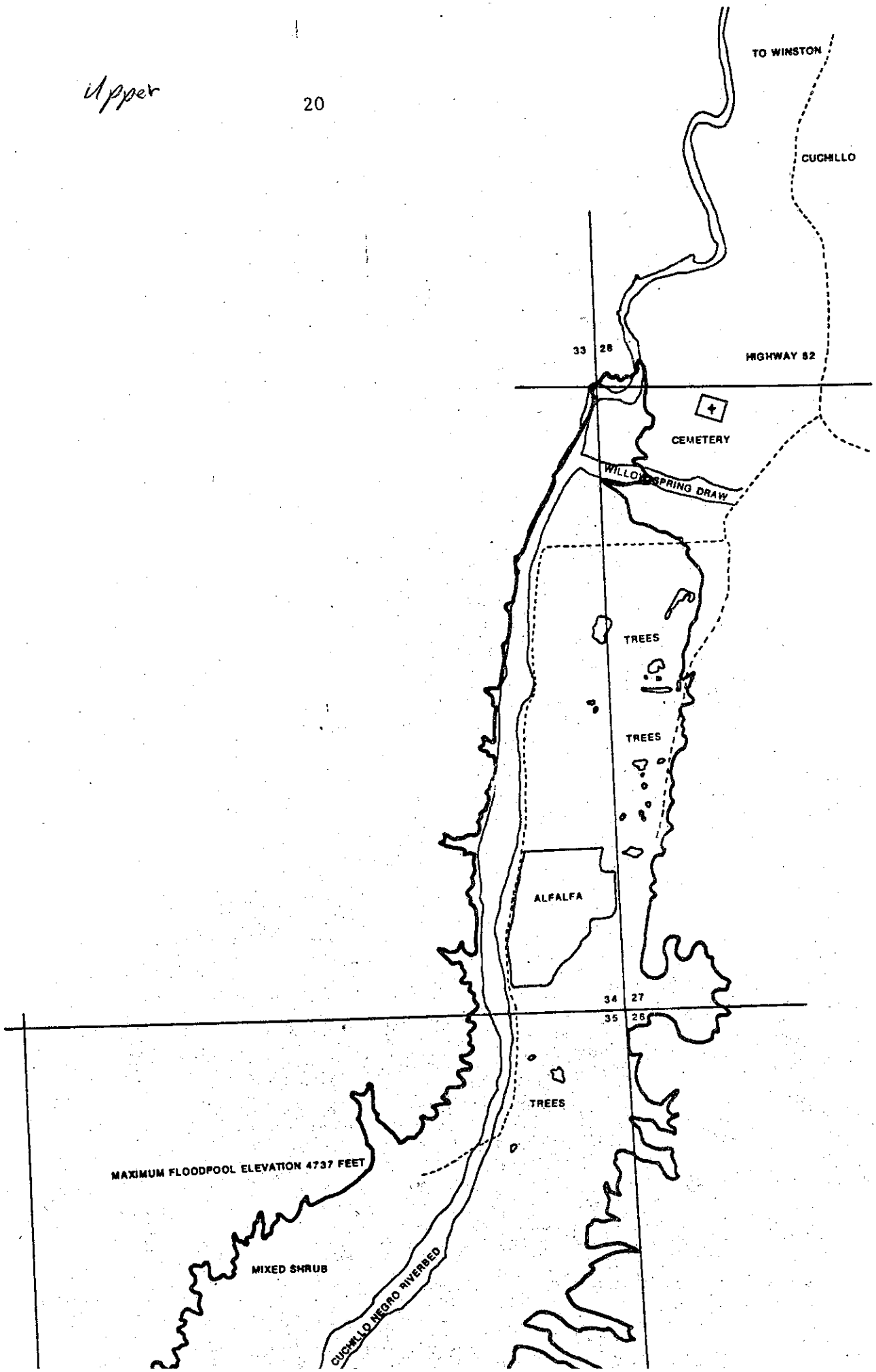
.n the
ect Area

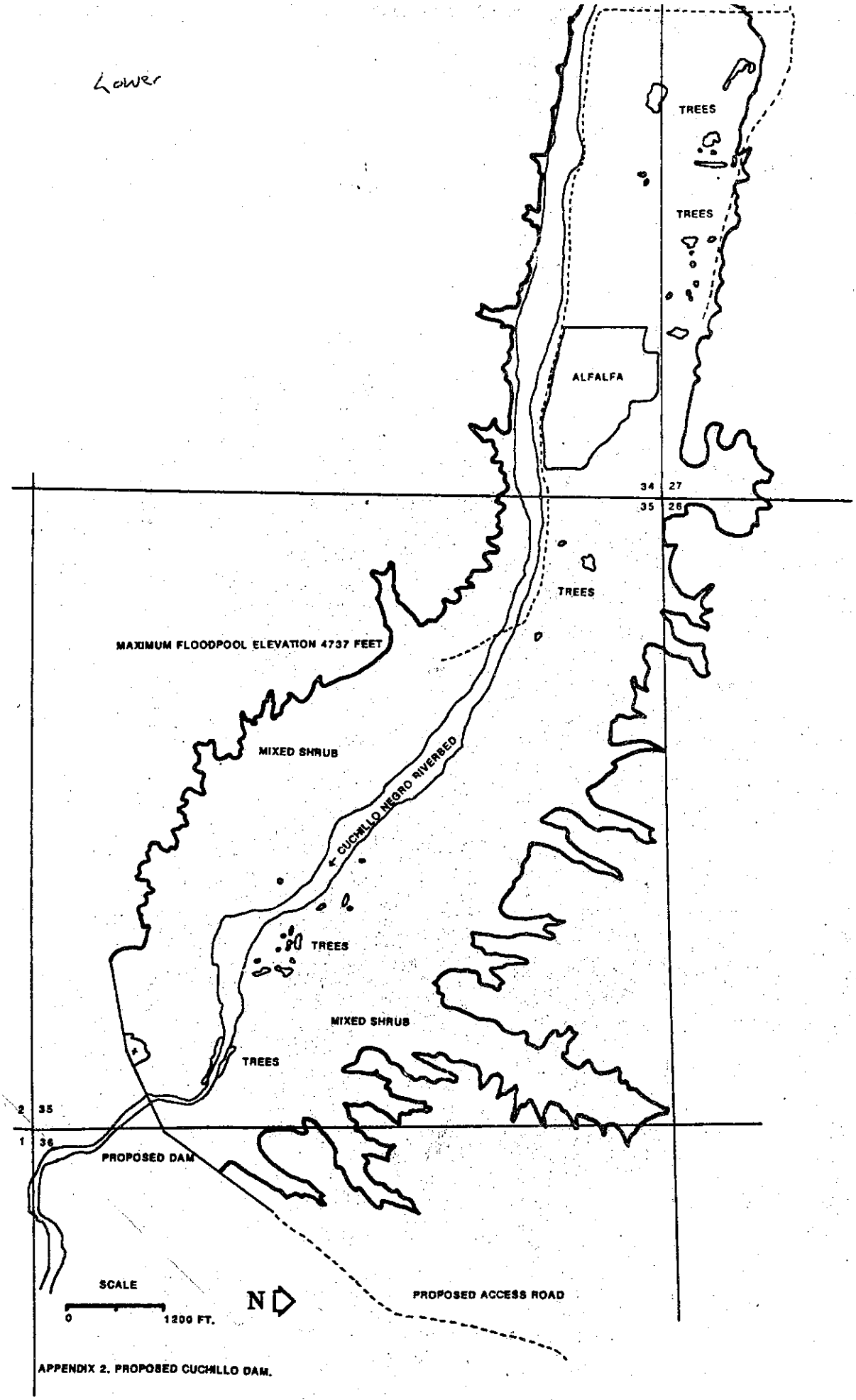
7 Upper Right




8 ~~Upper~~ Lower Right
Elephant Butte Reservoir
airport
C
M
M
W
W
R
Truth or Consequences
W
R
Engle

Upper


TO WINSTON
CUCHILLO
33
28
HIGHWAY 52
CEMETERY
WILLOW SPRING DRAW
TREES
TREES
ALFALFA
34
27
35
26
TREES
MAXIMUM FLOODPOOL ELEVATION 4737 FEET
MIXED SHRUB
CUCHILLO NEGRO RIVERBED



APPENDIX 2. PROPOSED CUCHILLO DAM.

APPENDIX 3

GOVERNOR
TONEY ANAYA
DIRECTOR AND SECRETARY
TO THE COMMISSION
HAROLD F. OLSON

State of New Mexico

STATE GAME COMMISSION
JAMES H. KOCH, CHAIRMAN
SANTA FE
A. H. GUTIERREZ, JR., M.D.
CARLSBAD
CHRISTINE DiGREGORIO
GALLUP
THOMAS P. ARVAS, O.D.
ALBUQUERQUE
JAKE ALCON
ALBUQUERQUE

DEPARTMENT OF GAME AND FISH

STATE CAPITOL
SANTA FE
87503

May 13, 1986

Mr. John Peterson
Field Supervisor
Ecological Services
U.S. Fish and Wildlife Service
P.O. Box 4487
Albuquerque, New Mexico 87196

Dear John:

Members of my staff have reviewed the final Fish and Wildlife Coordination Act Report for the Army Corps of Engineers project "Rio Grande Floodway, Truth or Consequences Unit, New Mexico." The report appears to address my agency's major concerns and in a manner that I believe is appropriate. I therefore concur and endorse your report.

Sincerely,

Harold F. Olson
Director

whb